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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,785	01/03/2002	Jeffrey B. Casady	2343-137-27	8552

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Supervisor, Patent Prosecution Services
PIPER MARBURY RUDNICK & WOLFE LLP
1200 Nineteenth Street, N.W.
Washington, DC 20036-2412

EXAMINER	
IM, JUNGHWA M	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 12/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/033,785	CASADY ET AL.	
	Examiner	Art Unit	
	Junghwa M. Im	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-19 and 38-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-19 and 38-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5-15 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Palmour (U.S. Pat. No. 5,270,554) with consideration of Kodama (U.S. Pat. No. 5,967,794) only to show the inherency.

Regarding claim 1, Fig. 1 of Palmour shows a semiconductor device comprising:

a substrate 10;

a semi-insulating silicon carbide layer 12 on the substrate (col. 8, lines 38-44), the semi-insulating silicon carbide layer comprising boron (col. 8, lines 54-58) and having boron-related D-center defects formed therein; and

a semiconductor device (MESFET) formed on the semi-insulating silicon carbide layer having an active area of a high band gap material 14(silicon carbide; col. 3, lines 22-25).

The semi-insulating silicon carbide layer of Palmour inherently has boron-related D-center defects when the silicon carbide layer is doped with boron. Kodama is introduced to show the inherency of boron-related defects which is disclosed throughout the specification especially in col.1, line 34-38. And a portion of col.3, lines 36-44 of Kodama shows substantially the identical disclosure to the instant invention starting on page 8, line 16 through on page 9, line 8.

Note that the Application discloses the boron-related D-center also known as a point defect on page 8, lines 17-24.

In addition, since Figure 1 of Palmour shows substantially identical in structure and/or composition, it is anticipated that the semi-insulating silicon carbide layer comprising boron has born-related D-center defects.

Regarding claim 2, Palmour shows the semi-insulating silicon carbide layer is formed epitaxially (col. 3, line 65).

In addition, note that "epitaxial growth" is a process designation and would not carry patentable weight in this claim drawn to a product. See *In re Thorp,* 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 5, Palmour discloses the semiconductor device is a high frequency device (col. 1, line 12).

Regarding claim 6, Palmour discloses the semiconductor device is a high power device (Abstract, line 1).

Regarding claim 7, Palmour discloses the substrate is a conductor (col. 3, lines 62-63).

Regarding claim 8, Palmour discloses the substrate is either n type or p type silicon carbide (col. 3, lines 62-63).

Regarding claims 9 and 10, Palmour discloses the semi-insulating silicon carbide layer Is 6H or 4H silicon carbide (col. 6, lines 3-4).

Regarding claim 11, Palmour discloses the semiconductor device comprises silicon carbide (col. 3, lines 22-25). Note that the semiconductor device is built on the SiC semi-insulating layer.

Regarding claims 12 and 13, Fig. 1 of Palmour shows the semiconductor device is a lateral MESTET. Palmour also discloses a MOSFET is used for high power applications (col. 1, lines 26-35).

Regarding claims 14 and 15, Palmour discloses a bipolar junction transistor and a JFET can be used for high power applications (col. 1, lines 26-35).

Regarding claims 19, Palmour discloses the first semiconductor device is formed epitaxially. In addition, note that "epitaxial growth" is a process designation and would not carry patentable weight in this claim drawn to a product. See *In re Thorp,* 227 USPQ 964 (Fed. Cir. 1985).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 38-40 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajit (U.S. Pat. No. 6,310.385) in view of Palmour.

Regarding claim 38, Fig. 4 of Ajit shows a semiconductor device comprising

a conducting substrate (155 and 67),

a semi-insulating silicon carbide layer 40 formed on the substrate (col. 3, lines 6-11); and

a first semiconductor device 20,10 over the substrate,

a second device 10, 20 over the substrate and the semi-insulating silicon carbide layer insulating the first device from the second device.

Figure 4 of Ajit shows substantially the entire claimed structure except the semi-insulating silicon carbide layer "being doped with boron and having boron-related D-center defects formed therein." Palmour discloses a semi-insulating silicon carbide layer doped with boron (col. 8, lines 54-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the teaching of Palmour to dope the silicon carbide layer of Ajit with boron in order to reduce the leakage current through a deep level doping. Since the silicon carbide layer of Palmour is doped with boron, thus having the identical semi-insulating layer with the same composition to the semi-insulating layer of the instant invention, it would be obvious that the semi-insulating silicon carbide layer with Palmour's teaching would have boron-related D-center defects formed therein.

Regarding claim 39, Fig. 4 of Ajit shows the first device formed over the first portion of the of the semi-insulating silicon carbide layer.

Regarding claims 40 and 44, Fig. 4 of Ajit shows a high power lateral device (col. 1, lines 11-14).

Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Palmour in view of Fujita et al. (U.S. Pat. No. 4, 794, 608).

Regarding claims 16-18, Palmour does not explicitly disclose a second device(or multiple chips) built on an SiC semi-insulating layer on a SiC substrate. Fujita et al. show a multiple devices built on the substrate (col. 5, lines 59-63). It would have been obvious to one of

ordinary skill in the art at the time of the invention to built a second chip (or multiple chip) on the same semi-insulating layer and the substrate of Palmour's device with the teaching of Fujita et al. in order to implement a circuit that requires more than one chip, as is usual in the art. And, it would have been obvious to have two chips electrically and physically isolated in order to have a chip operated individually.

Claims 41-43 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajit and Palmour as applied to claim 38 above, and further in view of Alok (U.S. Pat. No. 6,303,508).

Regarding claims 41, 43 and 45, the combined teachings of Ajit and Palmour show substantially the entire claimed structure except the specific applications for the second device. Alok discloses high voltage devices include control circuitry on the same chip (col. 3, lines 38-43). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify one of devices of combined teachings of Ajit and Palmour with the teaching of Alok to include a control device in order to reduce the power consumption in high voltage application and to form an integrated circuit including control circuit (col. 3, lines 41-47).

Regarding claim 42, Fig. 4 of Ajit combined with the teaching of Palmour shows substantially the entire claimed structure except the high frequency applications for the first device. Fig. 2 of Alok discloses two different devices built on SiC substrate, and discloses a high voltage and high frequency application (col. 1, lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Alok to the

device of Ajit and Palmour to have one of the device used for high frequency application to form a high frequency integrated circuit.

Regarding claim 46, Fig. 4 of Ajit combined with the teaching of Palmour shows substantially the entire claimed structure except the one of the devices being a vertical device. Fig. 2 of Alok show two device built on SiC substrate and one of the devices is a vertical device 140 (col.6, lines 2-3). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Alok to the device of Ajit and Palmour to have a vertical device on order to fabricate a high power integrated circuit.

An additional reference of Kamiyama et al. (U.S. Pat. No.5,597,744) is introduced to show that a vertical device is built on an semi-insulating SiC layer on the SiC substrate. Figure 8 shows an substantially identical structure to pending invention.

Response to Arguments

Applicant's arguments filed on December 2, 2003 have been fully considered but they are not persuasive. The rejection stands, modified only to accommodate the amendments made to the claims by Applicant. New rejection is made in response to Applicant's amended claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (703) 305-3998. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

jmi
December 9, 2003

Steven Loke